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Cutter bar

Description

The invention relates to a cutter bar of a cutting device of an agricultural implement.

Cutter bars comprise generally a finger bar, on which a plurality of reaping fingers are arranged. A knife is guided reciprocatingly relative to the finger bar, wherein the knife comprises a knife bar, on which several blades are attached. The blades form cutting edges, which with counter cutting edges, which are formed by the reaping fingers, interact.

The blades have generally a triangular base form. During the cutting procedure, the harvesting good, because of the reciprocating movement of the knife, is pressed by the blades against the reaping fingers and cut. Hereby, a scissor cut-like cutting step is produced, so that each individual blade is pushed to the back, when seen in a working direction, by the cutting load. So that the knife is held in its position relative to the finger bar, a supporting guide of the knife relative to the finger bar is necessary. Such a guide is shown in DE 198 50 261 A1. In the cutter bar shown there, a guide plate is mounted on the finger bar, which guide plate forms a guide face extending in the direction of the movement direction of the knife and is facing the knife. The knife is supported, when seen in working direction, to the rear by the knife bar on the guide face of the guide plate. While the knife bar is moved reciprocatingly, the guide plate is mounted rigidly on the finger bar. The knife is pressed in dependency of the cutting force more or less strongly against the guide plate. The cutting force can immensely increase because of harvesting good, which is difficult to cut, or because of bland knife blades, so that increased frictional forces are active between the knife bar and the guide plate. This leads especially with sandy and corundum-

containing soil to a larger wear on the knife bar and on the guide plate. Furthermore, besides the driving power, necessary for cutting the harvesting good, a significant part of the driving power is necessary for the reciprocating movement of the knife. The necessary driving power for moving the knife is often higher than the necessary driving power for the cutting process.

In CH 148 390 the frictional force is reduced by a roller guide. The guide plates have recesses, within which on the cutter bar rollers are rotational mounted. The knife is supported, when seen in working direction, to the rear on the rollers and is guided by the guide plates, wherein still friction is produced between the knife and the guide plates.

It is the object of the present invention, to provide a cutter bar, which has a long life time and allows an adaptation of the support for the knife.

The object is solved according to the invention by a cutter bar of a cutting device of an agricultural device comprising

- a longitudinal axis, along which the cutter bar is movable for cutting harvesting goods in a working direction,
- a finger bar,
- reaping fingers, attached on the finger bar and forming, respectively, counter cutting edges,
- a knife, having
    - a knife bar,
    - blades, attached on the knife bar and having, respectively, cutting edges,
    - wherein the knife is reciprocatingly guided along a transversal axis relative to the finger bar, which transversal axis is transversally and horizontally arranged to the longitudinal axis,
- rollers, by means of which the knife is supported on the finger bar to the rear, when seen in the working direction, wherein the rollers are, respectively, rotationally supported on a roller holder and wherein the roller holders are mounted on the finger bar.

Therefore, no frictional resistance between the knife and the finger bar has to be overcome. Only the rolling resistance of the rollers has to be overcome, which is distinctly lower. Thus, distinctly lower driving forces are necessary to drive the knife, so that smaller dimensioned drives can be used.

Because of the use of a roller holder, no specific fixing bores have to be provided for attaching the rollers. Rather, the roller holder can be adapted to the different cutter bars of different manufacturers. Furthermore, the possibility of retrofitting of existing cutter bar is given. A further advantage is the possibility of adjusting the roller holder in its position in reference to the finger bar.

Advantageously, the knife bar is supported on the rollers. Therefore, no additional components are necessary, which for example have to be mounted on the blade of the knife bar, to ensure a support.

The knife can vertically be supported on the rollers, to prevent a tipping of the knife in reference to the finger bar.

For this, the blades can project in the direction to the finger bar beyond the knife bar and can be vertically supported on the rollers. Thus, no further components are necessary for the vertical support.

Alternatively, it can be provided, that at least one roller has on its circumferential face a circumferentially extending first collar, on which the knife is supported vertically downwards.

Additionally, it can be provided, that at least one roller has on its circumferential face a circumferentially extending second collar, on which the knife is supported vertically upwards.

By this measure, the knife can also be vertically supported. For a better self-cleaning of penetrated soil material also neighbouring rollers can, alternatively, be provided, respectively, with one first collar or one second collar. I.e., one roller has only one

first collar, wherein the next neighbouring roller only has one second collar.

The rollers can, respectively, be rotationally supported on the finger bar around a vertically arranged rotational axis. For this, the rollers can, respectively, have a bearing bore, extending coaxially to the rotational axis and with which the rollers are, respectively, rotationally supported on an outer face of a bearing shaft and form together with the same a sliding-type bearing. This represents an extremely low cost and robust bearing arrangement, wherein the rollers and the bearing shafts can be manufactured from a hard-sintered material. Between the rollers and the corresponding bearing shafts, rolling member bearings can also be provided.

The radial bearing clearance of the sliding bearing should be dimensioned relative large, so that entered dirt and moisture can be removed from the sliding bearing. For this, at least one first longitudinal groove in the bearing bore of the roller may serve. At least one second longitudinal groove in the outer face of the bearing shaft can also serve for the self-cleaning. By means of the rotation of the rollers relative to the bearing shaft dirt is thus removed from the upper faces and is transported out of the sliding bearing.

The bearing shafts can be provided sleeve-like with a central attachment bore, wherein fixing screws are passed for the direct attachment of the bearing shaft on the finger bar through the attachment bores. As fixing screws , separate screws can serve, which rest in separate bores of the finger bar, as well as those screws, with which the reaping finger is attached on the finger bar. Rollers can be provided, depending on the loading, on each screw for attaching a reaping finger or only on some of the screws.

Preferably, the reaping fingers and the roller holders are attached by a common fixing screw on the finger bar.

In this case, the roller holders can, respectively, be attached by means of at least one fixing screw of a reaping finger.

The roller holders can, however, also be arranged between two reaping fingers arranged next to each other, wherein the roller holders are attached by means of the fixing screws of the two reaping fingers, arranged next to each other.

Preferred embodiments are described in the following by means of the drawings.

It shows

Fig. 1 a perspective view of a first embodiment of a cutter bar with a roller, attached on a roller holder,

Fig. 2 a top view of a second embodiment of a cutter bar,

Fig. 3 a longitudinal sectional view of the cutter bar of Fig. 2,

Fig. 4 a top view of a third embodiment of a cutter bar,

Fig. 5 a longitudinal sectional view of the cutter bar of Fig. 4,

Fig. 6 a top view of a fourth embodiment of a cutter bar and

Fig. 7 a longitudinal sectional view of the cutter bar of Fig. 6.

Fig. 1 shows a first embodiment of a cutter bar according to the invention and is described in the following.

The cutter bar comprises a finger bar 1, attached on an agricultural implement. On this reaping fingers 2 are arranged, which point with free ends 3 in the direction of the working direction of the agricultural implement and are arranged parallel to a longitudinal axis 4. A knife 5 is guided reciprocatingly movably along a transversal axis 6 relative to the finger bar 1, which transversal axis 6 extends at a right angle to the longitudinal axis 5. The knife 5 comprises a knife bar 7 as well as several blades 8, connected thereto. The blades 8 are supported in the direction of the transversal axis

6 on each other. The blades 8 form, respectively, a first cutting edge 9 and a second cutting edge 10. The first cutting edges 9 interact, respectively, at least with one first counter cutting edge 11 of a reaping finger 2. The second cutting edges 10 also interact, respectively, with at least one second counter cutting edge 12 of the reaping finger 2. The first cutting edges 9 and the first counter cutting edges 11 as well as the second cutting edges 10 and the second counter cutting edges 12 are, respectively, arranged at an angle to each other and form an angle, which, when seen in working direction, opens to the front. Therefore, during the reciprocating movement of the knife 5, a cutting movement is achieved comparable to that of a scissor, so that cutting forces are produced in the direction of the longitudinal axis 4 against the working direction.

For supporting the cutting forces, rollers 13 are provided, which are, respectively, rotationally supported around a vertically arranged rotational axis 14, which is arranged perpendicularly to the plane formed by the longitudinal axis 4 and the transversal axis 6. The knife bar 7 is supported with a support face 15 to the rear on the rollers 13. During the reciprocating movement of the knife 5, thus, the rollers are rotated reciprocatingly around the rotational axis 14, wherein no frictional forces but only a rolling resistance has to be exceeded.

A roller holder 17 is provided, which is mounted with an attachment portion 18 on the finger bar 1. For this serve the fixing screws 16 for attaching the reaping finger 2 on the finger bar 1. On a bearing portion 19 of the roller holder 17 the rollers 13 are rotationally supported.

The reaping fingers 2 are arranged vertically below the finger bar 1. In the finger bar 1 bores are provided, which, respectively, are aligned with a bore in one of the reaping fingers 2 and a bore of the roller holder 17. Through these bores, respectively, a fixing screw 16 is passed. Because of stability reasons, respectively, two reaping fingers 2 can be manufactured from one component and thus, form a double finger, formed U-like.

The blades 8 are attached via screws 20 on the knife bar 7 and are arranged verti-

cally above the knife bar 7. The blades 8 project in the direction towards the finger bar 1 to the rear beyond the knife bar 7 and are supported vertically downwards on the rollers 13. By means of this embodiment no further components are necessary for the support of the knife 5 on the rollers 13.

Figures 2 and 3 show a second embodiment of a cutter bar according to the invention, wherein components, which correspond to components of the first embodiment, are provided with reference numerals, which are increased by the numerical value 100.

As the knife of the first embodiment, the blades 108 project in the direction of the finger bar 101 to the rear beyond the knife bar 107 and are supported vertically downwards on the roller 113. The roller 113 has for this a first collar 121, which the blades 108 abut vertically downwards.

In contrast to the first embodiment, the reaping fingers 102, 102' are mounted vertically on the top of the finger bar 101, wherein between the reaping fingers 102, 102' and the finger bar 101 the roller holder is arranged and is fixed by means of the fixing screws of two neighbouring reaping fingers 102, 102'. The roller 113 is rotationally mounted by means of a screw 122 in a threaded bore 123 of the bearing portion 119 of the roller holder 117.

Figures 4 and 5 show a third embodiment, wherein components, which correspond to components of the first embodiment, are provided with reference numerals, which are increased by the numerical value 200.

Different to the second embodiment, the roller holder 217 is formed shorter and is attached by means of a fixing screw 216 of one of the reaping fingers 102 on the top of the reaping finger 202.

In the fourth embodiment according to Figures 6 and 7 components, which correspond to components of the first embodiment, are provided with reference numerals, which are increased by the numerical value 300.

In the fourth embodiment, the roller holders 317 are provided in the form of bridges, which are arranged between to neighbouring reaping fingers 302, 302', 302" and are fixed by means of the fixing screws 316 of the neighbouring reaping fingers 302, 302', 302".

Furthermore, one of the rollers has a first collar 321, against which the blades 308 are supported vertically downwards. A roller 313', arranged next to the roller 313, has a second collar 325, on which the blades 308 are vertically supported upwards. Thus an improved guide of the knife 305 is ensured.

Alternative thereto, all rollers can also have, respectively, a first collar and a second collar, so that the blades are supported vertically downwards as well as vertically upwards on each roller. The reaping fingers can further be arranged vertically below the finger bar, wherein also the roller holders would be arranged vertically below the reaping finger.

Reference numerals list

1, 101, 201, 301	finger bar
2, 102, 202, 302	reaping finger
3, 103, 203, 303	free end
4, 104, 204, 304	longitudinal axis
5, 105, 205, 305	knife
6, 106, 206, 306	transversal axis
7, 107, 207, 307	knife bar
8, 108, 208, 308	blade
9, 109, 209, 309	first cutting edge
10, 110, 210, 310	second cutting edge
11, 111, 211, 311	first counter cutting edge
12, 112, 212, 312	second counter cutting edge
13, 113, 213, 313	roller
14, 114, 214, 314	rotational axis
15, 115, 215, 315	support face
16, 116, 216, 316	fixing screw
17, 117, 217, 317	roller holder
18, 118, 218, 318	attachment portion
19, 119, 219, 319	bearing portion
20, 120, 220, 320	screw
121, 221, 321	first collar
22, 122, 222, 322	screw
123, 223, 322	threaded bore
124	holding down device
325	second collar

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Zusammenfassung